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A METHOD FOR ANTISEPTIC MATERIAL PREPARATION  
THROUGH COMBINATION OF NANOSILVER AND ACTIVATED CARBON FIBER

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## [57] Abstract

This invention concerns a method for antiseptic material preparation through combination of nanosilver and activated carbon fiber, in which the ion exchange process is applied to bond nanometer level silver and silver oxide ( $10^{-9}\text{m}$ ) on the surface of activated carbon fiber. The invention has the following advantages: 1. It greatly enhanced the bactericidal power of nanosilver. The indirect bactericidal diameter of nanosilver after combination with activated carbon fiber is about 15mm. 2. The activated carbon fiber treated with nanosilver can be made in suppository for the treatment of women vaginal infection and cervical erosion. The clinical application at several renowned hospitals including Beijing Concord Hospital and General Hospital of PLA has proved that the bactericidal efficiency of the antiseptic suppository is not affect by the acid-base scale. Unlike traditional medical administration concept, this invention takes advantage of the high conduction of carbon fiber to remove the pathogens in vagina so as to enable vagina to restore its normal physiological self-cleaning function. The total bacteriostatic efficiency is over 90%. /1

## Claims

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What is claimed is:

1. A method for antiseptic material preparation through combination of nanosilver and activated carbon fiber, whereas the ion exchange process is applied to bond nanometer level silver and

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<sup>1</sup> Numbers in the margin indicate pagination in the foreign text.

silver oxide ( $10^{-9}\text{m}$ ) on the surface of activated carbon fiber.

2. The method for antiseptic material preparation through combination of nanosilver and activated carbon fiber in Claim 1, whereas the above-mentioned ion exchange process is carried out in the following steps: (1) Take  $\text{AgNO}_3$  according to solution matching and dissolve it in water, add in concentrated  $\text{NH}_3\text{H}_2\text{O}$ , concentrated  $\text{NaOH}$  and  $\text{NH}_4\text{NO}_3$ , and well mix the solution; (2) Take glucose and dissolve it in water, add in concentrated  $\text{HNO}_3$  and alcohol, and well mix the solution; (3) Well mix the two solutions obtained from step (1) and step (2), soak activated carbon fiber in the solution at room temperature. Stir up to well mix the solution; (4) Add in oxidant and fully stir up to damp the oxidant, take out the oxidant after 5 minutes and squeeze away or whip out excessive solution. Place the oxidant in over to dry up. Repeat the cleansing and dry-up process for several times.

3. The method for antiseptic material preparation through combination of nanosilver and activated carbon fiber in Claim 2, whereas the antiseptic material is prepared through the following steps: Take 100g  $\text{AgNO}_3$  and dissolve it in 40L water; Add in 500ml concentrated  $\text{NH}_3\text{H}_2\text{O}$ , 50g concentrated  $\text{NaOH}$  and 500g concentrated  $\text{NH}_4\text{NO}_3$  to allow full dissolving in the solution; Take 20g glucose and

dissolve it in 5L water; Add in 10ml concentrated  $\text{HNO}_3$  and 1.5L alcohol and well mix the solution; Soak 10kg activated carbon fiber in the solution at room temperature for 5min; Stir up to well mix the solution; Add in 1L hydrogen dioxide solution and fully stir up to damp the oxidant, take out the oxidant after 5 minutes and squeeze away or whip out excessive solution. Place the oxidant in over to dry up. Repeat the cleansing and dry-up process for several times. /1

## Instructions

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### A Method for Antiseptic Material Preparation

through Combination of Nanosilver and Activated Carbon Fiber

#### **Invention Domain**

This invention concerns a method for combination of nanosilver and textiles, especially a method for antiseptic material preparation through combination of the antiseptic ability of nanosilver and activated carbon fiber.

#### **Background Technology**

The long-acting, broad-spectrum antiseptic property of nanosilver has been confirmed by studies of scientists worldwide and has been applied in clinical applications. Today, nanosilver and functional textiles are combined for clinical treatment of various

wounds. Because the bactericidal diameter of nanosilver is as small as about 2mm, the bactericidal space is fairly small. In addition, nanosilver depends on silver and silver oxide as carrier, while functional textile having a bactericidal diameter of 2mm~5mm has low adsorbability, especially when it meets water. As such, it is necessary to combine nanosilver with a material capable of adsorbing all kinds of pathogens.

### **Invention Content**

The objective of this invention is to overcome the defects of existing techniques and provide a method for antiseptic material preparation through combination of nanosilver and activated carbon fiber. The new method can greatly enhance the bactericidal power of nanosilver.

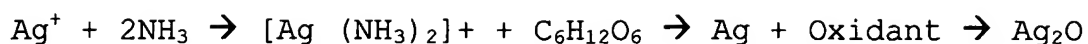
This invention provides a method for antiseptic material preparation through combination of nanosilver and activated carbon fiber, whereas the ion exchange process is applied to bond nanometer level silver and silver oxide ( $10^{-9}\text{m}$ ) on the surface of activated carbon fiber.

The above-mentioned ion exchange process is carried out in the following steps: (1) Take  $\text{AgNO}_3$  according to solution matching and dissolve it in water, add in concentrated  $\text{NH}_3\text{H}_2\text{O}$ , concentrated  $\text{NaOH}$

and  $\text{NH}_4\text{NO}_3$ , and well mix the solution; (2) Take glucose and dissolve it in water, add in concentrated  $\text{HNO}_3$  and alcohol, and well mix the solution; (3) Well mix the two solutions obtained from step (1) and step (2), soak activated carbon fiber in the solution at room temperature. Stir up to well mix the solution; (4) Add in oxidant and fully stir up to damp the oxidant, take out the oxidant after 5 minutes and squeeze away or whip out excessive solution. Place the oxidant in over to dry up. Repeat the cleansing and dry-up process for several times.

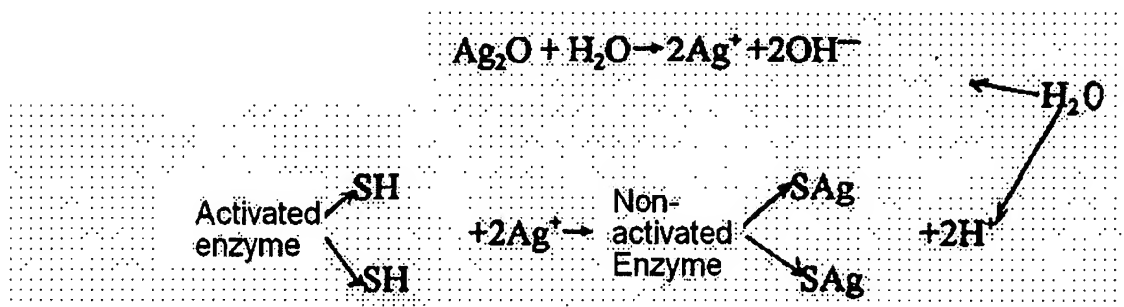
The antiseptic material is prepared through the following steps: Take 100g  $\text{AgNO}_3$  and dissolve it in 40L water; Add in 500ml concentrated  $\text{NH}_3\text{H}_2\text{O}$ , 50g concentrated  $\text{NaOH}$  and 500g concentrated  $\text{NH}_4\text{NO}_3$  to allow full dissolving in the solution; Take 20g glucose and dissolve it in 5L water; Add in 10ml concentrated  $\text{HNO}_3$  and 1.5L alcohol and well mix the solution; Soak 10kg activated carbon fiber in the solution at room temperature for 5min; Stir up to well mix the solution; Add in 1L hydrogen dioxide solution and fully stir up to damp the oxidant, take out the oxidant after 5 minutes and squeeze away or whip out excessive solution. Place the oxidant in over to dry up. Repeat the cleansing and dry-up process for several times.

The specific reaction mechanism of this invention is like this:



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The bactericidal mechanism of this invention is like this:



Ag<sup>+</sup> is easily bonded with sulfhydryl-SH in electropositive bacterial protein, causing the enzyme on which the pathogens survive to lose activity and thus achieving bactericidal effect. It is measured that the MIC of nanosilver on pathogens is 0.16~8.97mg/ml, and the MBC is 3.05~82.90mg/ml. The bactericidal diameter is 2mm~5mm. Activated carbon has high adsorption. The absorption weight can be as 20 times more than the weight of the carbon itself. According to the dynamics microporous filling theorem, the parameters of bacteria adsorption by activated carbon are higher than that by adsorption liquid. Therefore, the indirect bactericidal diameter of nanosilver after combining with activated carbon fiber is about 15mm.

The invention has the following advantages: 1. It greatly enhanced the bactericidal power of nanosilver. The indirect

bactericidal diameter of nanosilver after combination with activated carbon fiber is about 15mm. 2. The activated carbon fiber treated with nanosilver can be made in suppository for the treatment of women vaginal infection and cervical erosion. The clinical application at several renowned hospitals including Beijing Concord Hospital and General Hospital of PLA has proved that the bactericidal efficiency of the antiseptic suppository is not affect by the acid-base scale. Unlike traditional medical administration concept, this invention takes advantage of the high conduction of carbon fiber to remove the pathogens in vagina so as to enable vagina to restore its normal physiological self-cleaning function. The total bacteriostatic efficiency is over 90%.

### **Implementations**

The antiseptic material is prepared through the following steps: Take 100g  $\text{AgNO}_3$  and dissolve it in 40L water; Add in 500ml concentrated  $\text{NH}_3\text{H}_2\text{O}$ , 50g concentrated  $\text{NaOH}$  and 500g concentrated  $\text{NH}_4\text{NO}_3$  to allow full dissolving in the solution; Take 20g glucose and dissolve it in 5L water; Add in 10ml concentrated  $\text{HNO}_3$  and 1.5L alcohol and well mix the solution; Soak 10kg activated carbon fiber in the solution at room temperature for 5min; Stir up to well mix the solution; Add in 1L hydrogen dioxide solution and fully stir up to damp the oxidant,

take out the oxidant after 5 minutes and squeeze away or whip out excessive solution. Place the oxidant in over to dry up. Repeat the cleansing and dry-up process for several times to obtain the product of this invention.